Listing of Claims:

1.   (Currently Amended) A method for determining the presence of an activated catalyst site in a catalyst system comprising a catalyst precursor and an activator, wherein the catalyst system is capable of providing a luminescence, the method comprising:

    a)   performing a time resolved luminescence analysis on a reference analyte comprising the catalyst precursor that is not in combination with the activator, to produce a plurality of reference output values, each being associated with a time resolved emission intensity at an emission energy;

    b)   performing a time resolved luminescence analysis on a sample analyte comprising the catalyst precursor in combination with the activator, to produce a plurality of sample output values, each being associated with a time resolved emission intensity at an emission energy;

    c)   determining a reference emission energy and a reference lifetime each associated with a maximum emission intensity in the reference output values;

    d)   determining a sample emission energy and a sample lifetime each associated with a maximum emission intensity in the sample output values;

    e)   subtracting the sample emission energy from the reference emission energy to produce an energy difference value;

    f)   subtracting the sample lifetime from the reference lifetime to produce a lifetime difference value;

    g)   determining if the energy difference value, the lifetime difference value, or both, are an essentially non-zero value to determine if the sample comprises an activated catalyst site,

    h)   determining a total emission intensity value "I" from the sum of a plurality of sample output values which correlate to an essentially non-zero energy value; and

    i)   determining the concentration of an active catalyst site in the catalyst system present in the sample according to the equation $c=(a*b)/I$, wherein I is the total

emission intensity value, a is the extinction coefficient of the activated catalyst site in the catalyst system, b is a measure of the optical path length of the sample, and c is equal to a concentration of the active catalyst site in the sample comprising the catalyst system.

2.   (Original) The method of claim 1, further comprising determining if the energy difference value, the lifetime difference value, or both are positive numbers to determine if the sample comprises an activated catalyst site.

3.   (Original) The method of claim 1, further comprising determining if the energy difference value, the lifetime difference value, or both are negative numbers to determine if the sample comprises an activated catalyst site.

4.   (Original) The method of claim 1, wherein performing the time resolved luminescence analysis on an analyte comprises:

a)   irradiating the analyte with one or more wavelengths of electromagnetic energy; and

b)   measuring the time dependence and intensity of an emitted radiation at one or more emission energies.

5.   (Original) The method of claim 4, wherein the analyte is maintained at or below 25°C while performing the time resolved luminescence analysis.

6.   (Cancelled)

7.   (Original) The method of claim 1, wherein the time resolved luminescence analysis on the reference analyte and the time resolved luminescence analysis on the sample analyte are obtained in similar solvents, at similar temperatures, at similar analyte concentrations, at similar impurity concentrations, under similar external conditions, or a combination comprising at least one of the forgoing.

8.   (Original) The method of claim 1, wherein the determination of an energy difference value of greater than or equal to about 500 cm^{-1}, or less than or equal to about (-500 cm^{-1}) represents an activated catalyst site being present in the catalytic system.

9.-10. (Cancelled)

11.   (Original) The method of claim 1, wherein the determination of a lifetime difference value of greater than or equal to about 0.05 milliseconds represents an activated catalyst site being present in the catalytic system.

12-16. (Cancelled)

17.   (Original) The method of claim 1, wherein the sample emission energy, the sample lifetime, the reference emission energy, the reference lifetime, or a combination comprising at least one of the foregoing, are each determined from one or more output values which are greater than or equal to about 2.5 times the signal to noise ratio of the analysis.

18.   (Original) A method for determining the number of activated catalytic sites in a catalyst system comprising the method of claim 1, wherein the method further comprises:

        determining a plurality of sample emission energies and a plurality of sample lifetimes each individually associated with a particular maximum emission intensity in the sample output values;

        subtracting each sample emission energy from the reference emission energy to produce a plurality of energy difference values;

        subtracting each sample lifetime from the reference lifetime to produce a plurality of lifetime difference values; and

        determining if one or more of the plurality of energy difference values, the plurality of lifetime difference values, or a plurality of both, comprise an essentially non-zero value, wherein each non-zero energy difference value, each non-zero sample lifetime difference values, or both represent an active catalyst site in the catalyst system, to determine the number of active catalyst sites in the catalyst system.

19.   (Original) A method for determining the presence of a partially activated catalyst site in a catalyst system, comprising the method of claim 1, wherein the method further comprises:

determining a plurality of sample emission energies and a plurality of sample lifetimes each individually associated with a particular maximum emission intensity in the sample output values;

subtracting each sample emission energy from the reference emission energy to produce a plurality of energy difference values;

subtracting each sample lifetime from the reference lifetime to produce a plurality of lifetime difference values; and

determining if the plurality of energy difference values, the plurality of lifetime values, or both comprise an essentially zero value,

determining if the plurality of energy difference values, the plurality of lifetime values, or both comprise an essentially non-zero value, to determine the presence of a partially activated catalyst site in the catalyst system.

20.   (Cancelled)

21.   (Cancelled)

22.   (Original) The method of claim 1, wherein one or more essentially identical samples are prepared using different procedures.

23-31. (Cancelled)

32.   (Withdrawn) A method for determining the presence of an activated catalyst site in a catalyst system comprising a catalyst precursor and an activator, wherein the catalyst system is capable of providing a luminescence, the method comprising:

    a)   performing a time resolved luminescence analysis on a reference analyte comprising the catalyst precursor that is not in combination with the activator, to produce a plurality of reference output values, each being associated with a time resolved emission intensity at an emission energy;

    b)   performing a time resolved luminescence analysis on a sample analyte comprising the catalyst precursor in combination with the activator, to produce a plurality of sample output values, each being associated with a time resolved emission intensity at an emission energy;

c)   determining a reference emission energy and a corresponding reference lifetime associated with a maximum emission intensity in the reference output values;

d)   determining a sample emission energy and a corresponding sample lifetime associated with a maximum emission intensity in the sample output values;

e)   determining the activation index Ω for the sample emission energy and the corresponding sample lifetime, wherein the activation index is determined according to the equation:

$$\Omega = \left(\frac{\log(T_{\max}^{unactivated}) - \log(T_{\max}^{activated})}{\log(T_{\max}^{unactivated})} \right)^2 + \left(\frac{E_{\max}^{unactivated} - E_{\max}^{activated}}{E_{\max}^{unactivated}} \right)^2$$

wherein $T_{\max}^{unactivated}$ represents the reference lifetime;

$T_{\max}^{activated}$ represents the sample lifetime;

$E_{\max}^{unactivated}$ represents the reference emission energy

$E_{\max}^{activated}$ represents the sample emission energy

f)   determining if the activation index for the sample energy and the corresponding sample lifetime is an essentially non-zero value to determine if the sample comprises an activated catalyst site.

33.   (Withdrawn)   The method of claim 32, wherein performing the time resolved luminescence analysis on an analyte comprises:

a)   irradiating the analyte with one or more wavelengths of electromagnetic energy; and

b)   measuring the time dependence and intensity of an emitted radiation at one or more emission energies.

34.   (Withdrawn) The method of claim 33, wherein the analyte is maintained at or below 25°C while performing the time resolved luminescence analysis.

35.   (Withdrawn)   The method of claim 33, wherein the analyte is irradiated with electromagnetic energy having a wavelength of about 7000 Å to about 10Å.

36.   (Withdrawn)   The method of claim 32, wherein the time resolved luminescence analysis on the reference analyte and the time resolved luminescence analysis on the sample analyte are obtained in similar solvents, at similar temperatures, at similar analyte concentrations, at similar impurity concentrations, under similar external conditions, or a combination comprising at least one of the forgoing.

37.   (Withdrawn)   The method of claim 32, wherein determination of an activation of greater than or equal to about 0.001 represents an activated catalyst site being present in the catalytic system.

38.-39. (Cancelled)

40.   (Withdrawn)   The method of claim 32, wherein the sample emission energy, the sample lifetime, the reference emission energy, the reference lifetime, or a combination comprising at least one of the foregoing, are each determined from one or more output values which are greater than or equal to about 2.5 times the signal to noise ratio of the analysis.

41.   (Withdrawn)   A method for determining the number of activated catalytic sites in a catalyst system comprising the method of claim 32, wherein the method further comprises:

determining a plurality of sample emission energies and a plurality of sample lifetimes each individually associated with a particular maximum emission intensity in the sample output values;

determining the activation index Ω for each of the sample emission energies and their corresponding sample lifetimes wherein each essentially non-zero activation index Ω represent an active catalyst site in the catalyst system, to determine the number of active catalyst sites in the catalyst system.

42.   (Withdrawn) A method for determining the presence of a partially activated catalyst site in a catalyst system, comprising the method of claim 32, wherein the method further comprises:

determining a plurality of sample emission energies and a plurality of sample lifetimes each individually associated with a particular maximum emission intensity in the sample output values;

determining the activation index Ω for each of the sample emission energies and their corresponding sample lifetimes wherein each essentially non-zero activation index Ω represent an active catalyst site in the catalyst system, and wherein each essentially zero activation index value represents a partially activated catalyst site in the catalyst system, to determine the presence of a partially activated catalyst site in the catalyst system.

43.   (Withdrawn)   A method for quantitatively determining the concentration of an activated catalyst site in a sample comprising a catalyst system, the method comprising the steps of the method of claim 32, wherein the method further comprises:

determining a total emission intensity value "I" from the sum of a plurality of sample output values which correlate to an essentially non-zero activation index;

determining the concentration of an active catalyst site in the catalyst system present in the sample according to the equation $c=(a*b)/I$, wherein I is the total emission intensity value, a is the extinction coefficient of the activated catalyst site in the catalyst system, b is a measure of the optical path length of the sample, and c is equal to a concentration of the active catalyst site in the sample comprising the catalyst system.

44-54. (Cancelled)